Full SAP Calculation Printout

Property Reference	001_Copy	**Issued on Date**	07/03/2024
Assessment Reference	00001_Copy	**Prop Type Ref**	
Property	3 Gyles Court, Newquay, TR7 3ER		

SAP Rating	100 A	**DER**	-1.57	**TER**	9.43
Environmental	101 A	**% DER < TER**			116.65
CO_2 Emissions (t/year)	-0.21	**DFEE**	37.36	**TFEE**	42.52
Compliance Check	See BREL	**% DFEE < TFEE**			12.14
% DPER < TPER	90.66	**DPER**	4.71	**TPER**	50.45

Assessor Details	Mr. David Barsted	**Assessor ID**	AV66-0001
Client	SAP04579, Mr Shoesmith, Mrs Shoesmith		

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	68.9600	(1b)	x 2.3000	(2b) =	158.6080	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.9600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	158.6080	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		0.6000 (17)
Infiltration rate		0.0300 (18)
Number of sides sheltered		0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.0300 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.0382	0.0375	0.0367	0.0330	0.0323	0.0285	0.0285	0.0278	0.0300	0.0323	0.0338	0.0352	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	79.2000 (23c)

Effective ac	0.1422	0.1415	0.1407	0.1370	0.1362	0.1325	0.1325	0.1317	0.1340	0.1362	0.1377	0.1392	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window (Uw = 1.20)			8.8400	1.1450	10.1221			(27)
Front Door			2.0500	1.2000	2.4600			(26)
French Doors (Uw = 1.20)			3.2000	1.1450	3.6641			(27)
Heatloss Floor 1			68.9600	0.1100	7.5856	110.0000	7585.6000	(28a)
External Wall 1	81.4000	14.0900	67.3100	0.1600	10.7696	190.0000	12788.9000	(29a)
Cold Roof	68.9600		68.9600	0.1100	7.5856	9.0000	620.6400	(30)
Total net area of external elements Aum(A, m2)			219.3200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.1871			(33)
Internal Wall 1			62.7400			9.0000	564.6600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 21559.8000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	312.6421 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	9.4000	0.0280	0.2632

E3 Sill	5.6000	0.0270	0.1512		
E4 Jamb	18.9800	0.0210	0.3986		
E5 Ground floor (normal)	35.3900	0.1620	5.7332		
E10 Eaves (insulation at ceiling level)	23.8000	0.0720	1.7136		
E12 Gable (insulation at ceiling level)	11.5900	0.1740	2.0167		
E16 Corner (normal)	9.2000	0.0480	0.4416		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				10.7180	(36)
Point Thermal bridges			(36a) =	0.0000	
Total fabric heat loss			(33) + (36) + (36a) =	52.9051	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	7.4455	7.4062	7.3669	7.1707	7.1314	6.9351	6.9351	6.8959	7.0136	7.1314	7.2099	7.2884	(38)
Heat transfer coeff	60.3505	60.3113	60.2720	60.0757	60.0365	59.8402	59.8402	59.8010	59.9187	60.0365	60.1150	60.1935	(39)
Average = Sum(39)m / 12 =												60.0659	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8752	0.8746	0.8740	0.8712	0.8706	0.8678	0.8678	0.8672	0.8689	0.8706	0.8717	0.8729	(40)
HLP (average)												0.8710	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2206	(42)
Hot water usage for mixer showers	108.5082	106.8775	104.5013	99.9549	96.5997	92.8581	90.7313	93.0895	95.6746	99.6920	104.3361	108.0924	(42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses	39.3382	37.9077	36.4772	35.0468	33.6163	32.1858	32.1858	33.6163	35.0468	36.4772	37.9077	39.3382	(42c)
Average daily hot water use (litres/day)												135.8029	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.8464	144.7852	140.9785	135.0016	130.2160	125.0439	122.9171	126.7058	130.7214	136.1692	142.2438	147.4306	(44)
Energy conte	234.1525	206.1722	216.6788	184.8105	175.2958	153.7560	148.6576	156.8883	161.1925	184.7803	202.6523	230.8407	(45)
Energy content (annual)										Total = Sum(45)m =		2255.8776	
Distribution loss (46)m = 0.15 x (45)m	35.1229	30.9258	32.5018	27.7216	26.2944	23.0634	22.2986	23.5332	24.1789	27.7171	30.3979	34.6261	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.1500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.6210	(55)
Total storage loss	19.2510	17.3880	19.2510	18.6300	19.2510	18.6300	19.2510	19.2510	18.6300	19.2510	18.6300	19.2510	(56)
If cylinder contains dedicated solar storage	19.2510	17.3880	19.2510	18.6300	19.2510	18.6300	19.2510	19.2510	18.6300	19.2510	18.6300	19.2510	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	276.6659	244.5714	259.1922	225.9525	217.8092	194.8980	191.1710	199.4017	202.3345	227.2937	243.7943	273.3541	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	276.6659	244.5714	259.1922	225.9525	217.8092	194.8980	191.1710	199.4017	202.3345	227.2937	243.7943	273.3541	(64)
									Total per year (kWh/year) = Sum(64)m =			2756.4386	(64)
12Total per year (kWh/year)												2756	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
						Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =						0.0000	(64a)
Heat gains from water heating, kWh/month	111.8664	99.2716	106.0564	94.3631	92.2966	84.0375	83.4394	86.1761	86.5101	95.4502	100.2955	110.7653	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	111.0307	111.0307	111.0307	111.0307	111.0307	111.0307	111.0307	111.0307	111.0307	111.0307	111.0307	111.0307	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	100.8909	111.7007	100.8909	104.2539	100.8909	104.2539	100.8909	100.8909	104.2539	100.8909	104.2539	100.8909	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.8577	196.8797	191.7843	180.9368	167.2437	154.3742	145.7766	143.7545	148.8500	159.6975	173.3905	186.2601	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.1031	34.1031	34.1031	34.1031	34.1031	34.1031	34.1031	34.1031	34.1031	34.1031	34.1031	34.1031	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-88.8245	-88.8245	-88.8245	-88.8245	-88.8245	-88.8245	-88.8245	-88.8245	-88.8245	-88.8245	-88.8245	-88.8245	(71)
Water heating gains (Table 5)	150.3581	147.7256	142.5489	131.0598	124.0545	116.7187	112.1497	115.8281	120.1529	128.2933	139.2993	148.8780	(72)
Total internal gains	502.4159	512.6152	491.5333	472.5598	448.4984	431.6561	415.1264	416.7827	429.5660	445.1908	473.2530	492.3382	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	5.0900	19.6403	0.6300	0.7000	0.7700	30.5518	(76)
South	2.6200	46.7521	0.6300	0.7000	0.7700	37.4347	(78)
West	1.1300	19.6403	0.6300	0.7000	0.7700	6.7826	(80)
South	3.2000	46.7521	0.6300	0.7000	0.7700	45.7217	(78)

Solar gains	120.4908	209.2228	293.7570	371.4868	419.2969	416.6974	401.6326	366.5430	321.1074	233.5534	145.1203	102.5568	(83)
Total gains	622.9067	721.8380	785.2903	844.0465	867.7952	848.3535	816.7589	783.3257	750.6734	678.7442	618.3733	594.8950	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	99.2341	99.2987	99.3634	99.6880	99.7532	100.0804	100.0804	100.1461	99.9493	99.7532	99.6229	99.4930	
alpha	7.6156	7.6199	7.6242	7.6459	7.6502	7.6720	7.6720	7.6764	7.6633	7.6502	7.6415	7.6329	
util living area	0.9901	0.9710	0.9255	0.8086	0.6354	0.4509	0.3223	0.3511	0.5482	0.8443	0.9719	0.9928	(86)
Living	20.5619	20.6848	20.8097	20.9142	20.9522	20.9590	20.9594	20.9594	20.9574	20.9071	20.7209	20.5319	
Non living	19.6875	19.8398	19.9878	20.1014	20.1356	20.1427	20.1429	20.1435	20.1409	20.0977	19.8882	19.6514	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.7759	20.6848	20.8097	20.9142	20.9522	20.9590	20.9594	20.9594	20.9574	20.9071	20.7209	20.5974	(87)
Th 2	20.1887	20.1892	20.1896	20.1921	20.1926	20.1950	20.1950	20.1955	20.1940	20.1926	20.1916	20.1906	(88)
util rest of house	0.9866	0.9618	0.9047	0.7688	0.5834	0.3945	0.2634	0.2897	0.4854	0.8003	0.9612	0.9901	(89)
MIT 2	19.9889	19.8398	19.9878	20.1014	20.1356	20.1427	20.1429	20.1435	20.1409	20.0977	19.8882	19.7486	(90)
Living area fraction										fLA = Living area / (4) =		0.5006	(91)
MIT	20.3828	20.2628	20.3993	20.5083	20.5444	20.5513	20.5516	20.5519	20.5497	20.5029	20.3050	20.1735	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3828	20.2628	20.3993	20.5083	20.5444	20.5513	20.5516	20.5519	20.5497	20.5029	20.3050	20.1735	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9875	0.9627	0.9105	0.7849	0.6063	0.4195	0.2895	0.3169	0.5133	0.8181	0.9629	0.9901	(94)
Useful gains	615.1214	694.9127	715.0248	662.5264	526.1091	355.8634	236.4551	248.2625	385.2946	555.2784	595.4596	588.9915	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	970.6081	926.5490	837.7360	697.3746	530.9871	356.1284	236.4675	248.2876	386.4552	594.5347	793.8206	961.4985	(97)
Space heating kWh	264.4821	155.6596	91.2972	25.0907	3.6293	0.0000	0.0000	0.0000	0.0000	29.2067	142.8200	277.1452	(98a)
Space heating requirement - total per year (kWh/year)												989.3307	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	264.4821	155.6596	91.2972	25.0907	3.6293	0.0000	0.0000	0.0000	0.0000	29.2067	142.8200	277.1452	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												989.3307	
Space heating per m2											(98c) / (4) =	14.3464	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	258.1154	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	264.4821	155.6596	91.2972	25.0907	3.6293	0.0000	0.0000	0.0000	0.0000	29.2067	142.8200	277.1452	(98)
Space heating efficiency (main heating system 1)	258.1154	258.1154	258.1154	258.1154	258.1154	0.0000	0.0000	0.0000	0.0000	258.1154	258.1154	258.1154	(210)
Space heating fuel (main heating system)	102.4666	60.3062	35.3707	9.7207	1.4061	0.0000	0.0000	0.0000	0.0000	11.3153	55.3318	107.3726	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	276.6659	244.5714	259.1922	225.9525	217.8092	194.8980	191.1710	199.4017	202.3345	227.2937	243.7943	273.3541	(64)
Efficiency of water heater												280.5803	(216)
(217)m	280.5803	280.5803	280.5803	280.5803	280.5803	280.5803	280.5803	280.5803	280.5803	280.5803	280.5803	280.5803	(217)
Fuel for water heating, kWh/month	98.6049	87.1663	92.3772	80.5304	77.6281	69.4625	68.1342	71.0676	72.1129	81.0085	86.8893	97.4246	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	21.9810	19.8538	21.9810	21.2719	21.9810	21.2719	21.9810	21.9810	21.2719	21.9810	21.2719	21.9810	(231)
Lighting	20.2103	16.2135	14.5984	10.6954	8.2615	6.7497	7.5364	9.7961	12.7241	16.6948	18.8567	20.7720	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-43.9202	-66.9094	-103.0094	-118.4133	-128.2321	-119.8758	-118.0199	-110.9998	-96.0567	-76.6219	-49.1139	-37.0455	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-19.4263	-48.7651	-118.2770	-209.7701	-302.0115	-312.6378	-304.8044	-242.3852	-158.1577	-78.0642	-28.0431	-14.5734	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	383.2901	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	280.5803	
Water heating fuel used	982.4064	(219)
Space cooling fuel	0.0000	(221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.3375)		
mechanical ventilation fans (SFP = 1.3375)	258.8086	(230a)
Total electricity for the above, kWh/year	258.8086	(231)
Electricity for lighting (calculated in Appendix L)	163.1089	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2905.1336	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	-1117.5195	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	383.2901	0.1585	60.7342	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	982.4064	0.1411	138.5891	(264)
Space and water heating			199.3232	(265)
Pumps, fans and electric keep-hot	258.8086	0.1387	35.8999	(267)
Energy for lighting	163.1089	0.1443	23.5417	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1068.2179	0.1339	-142.9961	
PV Unit electricity exported	-1836.9157	0.1221	-224.3296	
Total			-367.3256	(269)
Total CO2, kg/year			-108.5608	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			-1.5700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	383.2901	1.5865	608.0950	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	982.4064	1.5216	1494.8670	(278)
Space and water heating			2102.9620	(279)
Pumps, fans and electric keep-hot	258.8086	1.5128	391.5257	(281)
Energy for lighting	163.1089	1.5338	250.1819	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1068.2179	1.4947	-1596.6768	
PV Unit electricity exported	-1836.9157	0.4481	-823.1472	
Total			-2419.8239	(283)
Total Primary energy kWh/year			324.8456	(286)
Dwelling Primary energy Rate (DPER)			4.7100	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		68.9600 (1b)	x	2.3000 (2b)	=	158.6080	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.9600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	158.6080	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1261	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3761	(18)
Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3761	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4795	0.4701	0.4607	0.4137	0.4043	0.3573	0.3573	0.3479	0.3761	0.4043	0.4231	0.4419	(22b)
Effective ac	0.6150	0.6105	0.6061	0.5856	0.5817	0.5638	0.5638	0.5605	0.5707	0.5817	0.5895	0.5976	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.0500	1.0000	2.0500			(26)
TER Opening Type (Uw = 1.20)			12.0400	1.1450	13.7863			(27)
Heatloss Floor 1			68.9600	0.1300	8.9648			(28a)
External Wall 1	81.4000	14.0900	67.3100	0.1800	12.1158			(29a)
Cold Roof	68.9600		68.9600	0.1100	7.5856			(30)
Total net area of external elements Aum(A, m2)			219.3200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.5025			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 312.6421 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	9.4000	0.0500	0.4700
E3 Sill	5.6000	0.0500	0.2800
E4 Jamb	18.9800	0.0500	0.9490
E5 Ground floor (normal)	35.3900	0.1600	5.6624
E10 Eaves (insulation at ceiling level)	23.8000	0.0600	1.4280
E12 Gable (insulation at ceiling level)	11.5900	0.0600	0.6954
E16 Corner (normal)	9.2000	0.0900	0.8280

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.3128 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 54.8153 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.1880	31.9543	31.7253	30.6495	30.4482	29.5112	29.5112	29.3376	29.8721	30.4482	30.8554	31.2811	(38)
Heat transfer coeff	87.0033	86.7696	86.5405	85.4647	85.2634	84.3264	84.3264	84.1529	84.6873	85.2634	85.6706	86.0963	(39)
Average = Sum(39)m / 12 =												85.4638	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2616	1.2583	1.2549	1.2393	1.2364	1.2228	1.2228	1.2203	1.2281	1.2364	1.2423	1.2485	(40)
HLP (average)												1.2393	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2206 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	78.9150	77.7291	76.0009	72.6944	70.2543	67.5331	65.9864	67.7015	69.5815	72.5033	75.8808	78.6127	(42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses	37.3713	36.0123	34.6534	33.2944	31.9355	30.5765	30.5765	31.9355	33.2944	34.6534	36.0123	37.3713	(42c)
Average daily hot water use (litres/day)												106.7309	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	116.2863	113.7414	110.6543	105.9889	102.1898	98.1097	96.5629	99.6370	102.8759	107.1566	111.8931	115.9840	(44)
Energy conte	184.1691	161.9663	170.0716	145.0935	137.5671	120.6373	116.7845	123.3714	126.8563	145.4105	159.4122	181.6029	(45)
Energy content (annual)										Total = Sum(45)m =		1772.9427	
Distribution loss (46)m = 0.15 x (45)m	27.6254	24.2949	25.5107	21.7640	20.6351	18.0956	17.5177	18.5057	19.0284	21.8116	23.9118	27.2404	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	230.7640	204.0520	216.6665	190.1853	184.1620	165.7291	163.3794	169.9663	171.9482	192.0054	204.5041	228.1978	(62)
WWHRS	-36.0767	-31.9065	-33.4106	-27.6653	-25.7831	-22.0628	-20.6803	-21.9915	-22.8270	-26.9105	-30.4863	-35.4086	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	194.6874	172.1455	183.2558	162.5200	158.3789	143.6663	142.6991	147.9748	149.1212	165.0949	174.0177	192.7892	(64)
										Total per year (kWh/year) = Sum(64)m =		1986.3509	(64)
12Total per year (kWh/year)												1986	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	98.5122	87.5224	93.8247	84.3171	83.0170	76.1854	76.1068	78.2969	78.2532	85.6249	89.0780	97.6589	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	111.0307	111.0307	111.0307	111.0307	111.0307	111.0307	111.0307	111.0307	111.0307	111.0307	111.0307	111.0307	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	100.8909	111.7007	100.8909	104.2539	100.8909	104.2539	100.8909	100.8909	104.2539	100.8909	104.2539	100.8909	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.8577	196.8797	191.7843	180.9368	167.2437	154.3742	145.7766	143.7545	148.8500	159.6975	173.3905	186.2601	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.1031	34.1031	34.1031	34.1031	34.1031	34.1031	34.1031	34.1031	34.1031	34.1031	34.1031	34.1031	(69)

Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-88.8245	-88.8245	-88.8245	-88.8245	-88.8245	-88.8245	-88.8245	-88.8245	-88.8245	-88.8245	-88.8245	-88.8245	(71)
Water heating gains (Table 5)													
	132.4088	130.2416	126.1085	117.1070	111.5820	105.8130	102.2940	105.2378	108.6850	115.0873	123.7195	131.2619	(72)
Total internal gains													
	487.4666	498.1312	478.0929	461.6069	439.0258	420.7503	405.2707	406.1924	418.0981	434.9848	460.6732	477.7221	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	5.0900	19.6403	0.6300	0.7000	0.7700	30.5518	(76)
South	5.8200	46.7521	0.6300	0.7000	0.7700	83.1564	(78)
West	1.1300	19.6403	0.6300	0.7000	0.7700	6.7826	(80)

Solar gains	120.4908	209.2228	293.7570	371.4868	419.2969	416.6974	401.6326	366.5430	321.1074	233.5534	145.1203	102.5568	(83)
Total gains	607.9574	707.3540	771.8499	833.0937	858.3227	837.4478	806.9033	772.7355	739.2055	668.5382	605.7935	580.2789	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.8346	69.0200	69.2026	70.0738	70.2392	71.0197	71.0197	71.1661	70.7170	70.2392	69.9053	69.5597	
alpha	5.5890	5.6013	5.6135	5.6716	5.6826	5.7346	5.7346	5.7444	5.7145	5.6826	5.6604	5.6373	
util living area													
	0.9955	0.9890	0.9738	0.9253	0.8147	0.6250	0.4569	0.4962	0.7361	0.9418	0.9892	0.9965	(86)
MIT	19.9185	20.1097	20.3573	20.6630	20.8800	20.9791	20.9970	20.9953	20.9484	20.6707	20.2431	19.8902	(87)
Th 2	19.8710	19.8737	19.8763	19.8887	19.8910	19.9018	19.9018	19.9038	19.8976	19.8910	19.8863	19.8814	(88)
util rest of house													
	0.9937	0.9846	0.9632	0.8960	0.7509	0.5270	0.3446	0.3806	0.6412	0.9123	0.9841	0.9951	(89)
MIT 2	18.6422	18.8863	19.1977	19.5722	19.8024	19.8923	19.9011	19.9026	19.8696	19.5914	19.0666	18.6140	(90)
Living area fraction									fLA = Living area / (4) =			0.5006	(91)
MIT	19.2811	19.4987	19.7782	20.1182	20.3418	20.4363	20.4497	20.4496	20.4096	20.1317	19.6555	19.2528	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2811	19.4987	19.7782	20.1182	20.3418	20.4363	20.4497	20.4496	20.4096	20.1317	19.6555	19.2528	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9924	0.9827	0.9621	0.9029	0.7786	0.5759	0.4010	0.4388	0.6875	0.9198	0.9827	0.9940	(94)
Useful gains	603.3567	695.1462	742.6032	752.1827	668.3069	482.2525	323.5804	339.0486	508.2099	614.8941	595.3018	576.8063	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1303.4017	1266.7271	1149.1003	958.7614	736.8330	492.1548	324.6303	340.7831	534.3468	812.7034	1075.6362	1295.9922	(97)
Space heating kWh													
	520.8335	384.1023	302.4339	148.7366	50.9834	0.0000	0.0000	0.0000	0.0000	147.1701	345.8408	535.0743	(98a)
Space heating requirement - total per year (kWh/year)												2435.1750	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	520.8335	384.1023	302.4339	148.7366	50.9834	0.0000	0.0000	0.0000	0.0000	147.1701	345.8408	535.0743	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2435.1750	
Space heating per m2											(98c) / (4) =	35.3129	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	520.8335	384.1023	302.4339	148.7366	50.9834	0.0000	0.0000	0.0000	0.0000	147.1701	345.8408	535.0743	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	564.2833	416.1455	327.6640	161.1448	55.2366	0.0000	0.0000	0.0000	0.0000	159.4476	374.6921	579.7121	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	194.6874	172.1455	183.2558	162.5200	158.3789	143.6663	142.6991	147.9748	149.1212	165.0949	174.0177	192.7892	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.1561	85.8051	85.1755	83.8615	81.8194	79.8000	79.8000	79.8000	79.8000	83.8030	85.5695	86.2243	(217)
Fuel for water heating, kWh/month													
	225.9704	200.6238	215.1510	193.7956	193.5714	180.0330	178.8209	185.4321	186.8686	197.0036	203.3642	223.5904	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	20.9631	16.8174	15.1422	11.0938	8.5692	7.0011	7.8171	10.1610	13.1981	17.3166	19.5591	21.5458	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-53.6984	-70.7960	-95.2700	-100.1150	-102.4674	-93.8031	-92.6550	-90.0616	-84.8261	-77.4810	-57.2707	-47.0277	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m	-47.2726	-96.8489	-187.9067	-275.8570	-358.8298	-358.3905	-354.1291	-302.4436	-225.2584	-136.2037	-62.3305	-37.5779	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2638.3261	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2384.2251	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	169.1845	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-3408.5208	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1869.2150	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2638.3261	0.2100	554.0485	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2384.2251	0.2100	500.6873	(264)
Space and water heating			1054.7358	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	169.1845	0.1443	24.4186	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-965.4722	0.1360	-131.3262	
PV Unit electricity exported	-2443.0486	0.1266	-309.2533	
Total			-440.5795	(269)
Total CO2, kg/year			650.5040	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.4300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2638.3261	1.1300	2981.3085	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2384.2251	1.1300	2694.1744	(278)
Space and water heating			5675.4829	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	169.1845	1.5338	259.5009	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-965.4722	1.5028	-1450.9069	
PV Unit electricity exported	-2443.0486	0.4647	-1135.2475	
Total			-2586.1544	(283)
Total Primary energy kWh/year			3478.9302	(286)
Target Primary Energy Rate (TPER)			50.4500	(287)